

represent a district free from superficial accumulations, and in which numerous alternations of hard and soft beds afford the greatest facilities in detecting every deviation of the strata from their normal position, the minute structure of the country will be found delineated in the most exquisite detail; while in an adjoining sheet broad spreads of colour separated by dotted lines constitute a confession that the surveyor was here engaged in an almost hopeless task. It may, indeed, be questioned whether on a map of so large a scale as that of the Geological Survey, any useful purpose is answered by attempts to define the boundaries of formations buried under several hundreds of feet of boulder-clay or gravel. Another serious obstacle to the perfecting of our geological maps is found in the circumstance that rocks of identical mineralogical composition, but of very different geological age, are found occasionally in direct apposition; and in such cases (except in the rare instances of numerous sections affording fossils characteristic of either formation presenting themselves) the field-geologist finds himself hopelessly at fault. For example, in those parts of England in which the limestones and grits of the Coralline Oolite are found intervening between the Oxford and Kimmeridge clays the work of the surveyor is an easy one; but where, as is frequently the case, the first-mentioned formation is absent and the one series of argillaceous strata lies directly upon the other, the result attained by him is necessarily of the most vague and uncertain character. On the other hand, many of the hard and well marked rock-masses, which the geological surveyor naturally seizes upon in drawing his lines of boundary, are too frequently, alas, shown by the palæontologist to be altogether destitute of any important significance.

In spite, however, of these unavoidable inequalities and imperfections in its execution, the map of the Geological Survey is a splendid work, and one of which the country may justly be proud; it has already largely prevented the wasteful expenditure of the resources of the empire in futile undertakings, while it has brought to light many unsuspected sources of mineral wealth; and it is hard to say whether in the future the aid which it will render to those engaged in scientific research will not outrival that which it now affords to industrial enterprise.

The methods pursued by the Geological Survey of this country, in seeking to realise that ideal to which we have adverted, have been gradually *developed* in the hands of the numerous able observers and sagacious thinkers, who have since its foundation been members of its staff. Hitherto, however, these methods have been handed down by tradition only, and no work has existed to which an outsider or foreigner could refer for an exposition and illustration of them. Hence we gladly hail the appearance of the present work, as satisfying a want which has long been felt and frequently expressed.

In the execution of his task we consider that the author has been on the whole very successful, especially when we remember that the experiment is the first of its kind. His explanations are strikingly clear, simple, and full; indeed, we may perhaps suggest that some of the minute details into which he enters are unnecessary for the class of persons to whom alone the book is likely to be of service—those, namely, who have mastered the elementary principles of geological science. For ex-

ample, we think that the author might fairly have given his readers credit for sufficient knowledge of plane trigonometry to have enabled them to make use of a very simple formula; and he should therefore, it seems to us, have substituted such a formula, with a table of tangents, for the rule-of-thumb and not very accurate methods for calculating true from apparent dips, given in pp. 42-46. His very minute directions, too, concerning the method of running levels for the purpose of preparing geological sections are, we think, a little out of place here, as they differ in no respect from those in ordinary use among engineers and surveyors, and may be found described in any treatise on land-surveying. On the other hand, his suggestions as to the use of two aneroids, one to be examined every half hour at a fixed station, though correct enough in theory, with other less exact methods applied to running lines of level, are certainly likely to be of little actual value to the geologist; while there is an omission of any reference to the really practicable applications of a single aneroid, when used with Airy's tables, either for calculating approximately the difference of level between two points (*e.g.*, the height of a bed of gravel above the level of the present stream), or in supplementing the data found on a contoured map; neither does our author refer to the use of Abney's level and several other simple contrivances which will be found very useful for the same purpose.

The sections on "Lithology" and "Palæontology" are treated with less diffuseness than those on the preparation of geological maps and sections. In a work of reference like the present we cannot but regard the reduction of the information to a tabular form, wherever this is practicable, as a great convenience; and we commend the adoption of the method in this part of the work. Mr. Jukes-Browne's remarks on the collection, preservation, and determination of fossils are, if not exhaustive, at least very useful and practical; but we can only consider the index of characteristic fossils, as unnecessarily increasing the bulk of the book, for no geologist who is able to determine the species of a fossil is likely to be at any loss as to the geological horizon to which it belongs.

Geological surveying is an art which for its successful performance requires some natural aptitude, a considerable knowledge of the principles and results of geological science, careful training, and much practice. The perusal of Mr. Penning's valuable hand-book will not make a man a geological surveyor, but it may enable him to appreciate some of the methods employed in the work—at least under its simplest conditions—as carried out by our national survey. And he who has mastered these first principles as here set forth will be the better prepared to encounter the more difficult problems which are presented by areas of more complicated geological structure and provided with less perfect topographical maps than our own.

J. W. J.

THE BATS OF ASIA

Monograph of the Asiatic Chiroptera. By G. E. Dobson, M.A., M.B. (Printed by order of the Trustees of the Indian Museum, 1876.)

BIOLOGISTS have, during the last few years, learnt with interest many of the valuable facts brought forward by Mr. Dobson, of Netley, with reference to the

anatomy and classification of the bats of Asia. The author tells us in the work under notice, which is the summary of the results of his investigation, that he was led to the special study of the Chiroptera from a desire to write a descriptive catalogue of the species of bats preserved in the Indian Museum at Calcutta. Finding, however, that but few species were not therein contained, the author, much to the advantage of his fellow-zoologists, determined to incorporate an account of all the Asiatic forms, the result being that he has presented us with a complete Monograph of the Asiatic Chiroptera.

Further, there being but four species of bats found in Europe which are not also Asiatic, these are also described in footnotes, which still further increases the value of the volume, making it, in fact, a monograph of the Asiatic and European Chiroptera.

There are a hundred woodcuts, mostly original illustrating the configuration of the head and nasal appendages of the most characteristic of the 122 species described; and the work in its letterpress and size corresponds with the valuable catalogues of the zoological collections in the British Museum.

Mr. Dobson divides the order primarily into the Megachiroptera and Microchiroptera, these sub-orders corresponding to the Frugivorous and Insectivorous Bats as usually described. The former of them are arranged in two groups—the Pteropi, with the tongue short and the molar teeth well developed; and the Macroglossi, with lengthy tongues and molars scarcely elevated above the gums.

With reference to the Microchiroptera two branches are assumed to have diverged from the ancestral forms (Palæochiroptera) of the order; one of these, the Vespertilionine Alliance, includes the Vespertilionidæ, Nycteridæ, and Rhinolophidæ; the other, the Emballonurine Alliance, the Emballonuridæ and Phyllostomidæ. This important division is shown to be based upon several well-marked anatomical characters, the members of the Vespertilionine Alliance having the tail always contained within the interfemoral membrane, which it never perforates; the first phalanx of the middle finger extended, during repose, in a line with the metacarpal bone; the premaxillary bones rudimentary, and consequently the incisors small; and the hair scales imbricated, the tips of the scales being arranged in an oblique line, not terminating in acute projections. In the members of the Emballonurine Alliance, on the other hand, the tail, if present, generally perforates the interfemoral membrane; the first phalanx of the middle finger is more or less completely folded forwards, during repose, upon the superior or inferior surface of the metacarpal bone; the premaxillæ with the incisor teeth are large; and the hair-scales are arranged in a transverse series, the tips of the scales nearly always terminating in acute projections.

The character of the hair-scales is one which Mr. Dobson has investigated with special care, and he has submitted his specimens—from more than forty genera—to the inspection of Dr. J. D. Macdonald, who has confirmed his generalisation, except with reference to *Miniopterus* and *Myiastina*, the one otherwise recognisable as an intermediate form, and the other quite peculiar as far as its hair is concerned.

Although the Fruit-bats are included in a separate sub-

order, in other words, though they are assumed to have developed “from a group of Palæochiroptera distinct from that from which the Vespertilionine and Emballonurine alliances have sprung,” nevertheless, Mr. Dobson considers that they have affinities with that section of the latter group from which the Emballonuridæ are derived. This we cannot quite understand. May not the retention of a second index phalanx in *Rhinopoma*, and of well-developed incisors in the Phyllostomidæ be but a want of divergence from the Palæochiropterous type in the branch on which they are placed? a similar absence of modification in the independently-developed Pteropinæ being followed by a similar result as far as structure is concerned. This would, however, have no effect upon the independence of the pedigree-lines of the two groups, and would not make them blend in any parts of their course.

Mr. Dobson lays stress, in his definition of the sub-family Phyllorhininæ on the union of the ilio-pectineal spine with the antero-inferior surface of the ilium, forming a large preacetabular foramen. This unique arrangement, discovered by Mr. Dobson himself, is one which has scarcely attracted the attention of osteologists to the extent which it deserves.

The descriptions of the species are detailed and extremely precise; the synonymy is full, at the same time that the tables of measurements as well as those of specific distinctions will be found invaluable. The work, as a whole, is one of the most important recent additions to zoological literature.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

Sun-Spots suspected to be Identical with an Inter-Mercurial Planet

1875, Feb. 22^d 0^h.—One very minute spot was seen near the first limb. Not seen afterwards (on Feb. 23^d 0^h), others seen.

1875, Aug. 30^d 1^h.—A circular spot of intense blackness was seen near the second limb.

1875, Aug. 30^d 23^h.—Not seen, perhaps from clouds; other spots seen.

1876, March 7^d 0^h 30^m.—After a careful search only one very small spot was seen. This was without penumbra, but surrounded by bright faculæ (the drawing represents it as circular).

Transits of the Spot and the Limbs of the Sun.

			h.	m.	s.
⊙ 1 4	...	...	23	29	47.7
Spot	...	...	29	59	0
⊙ 2 4	...	...	31	57.8	Cloudy afterwards.

Not visible March 9^d 0^h 30^m, though another spot appeared in quite another part of the sun.

Observations of the spots on the disk of the sun are made regularly every day (excepting Sundays) when the sky is clear by Mr. F. Bellamy, and the above are notes which were made by him at the times of observation.

ROBERT MAIN

Radcliffe Observatory, Oxford

Erratum in Mr. Wallace's Address

PLEASE allow me to point out an error in my address as given in your issue of September 7 (vol. xiv. p. 407). Instead of “*Pelargonium* of Kerguelen's Land” read “*Pelargonium* of Tristan d'Acunha.” This oversight was pointed out to me by Dr. Hooker in time to be corrected in the “Address” as published by the Association.

ALFRED R. WALLACE